

Section I.

Please amend the claims as set out in **Section II** (Amendments to the Claims) in the format proposed by the U.S. Patent and Trademark Office for adoption in July, 2003 revising 37 C.F.R. §1.121, pursuant to the Notice published on February 25, 2003 at 1267 OG 106, accepting current submissions of amendments in such revised format.

Section II. (Amendments to the Claims)

Claims 1-3, 5-9, 35, and 39-42 are hereby amended, as follows:

- (1) 1. (Currently amended) A gallium nitride-based HEMT device, comprising ~~an at least partially relaxed~~ a channel layer comprising ~~an~~ InGa_N alloy and at least one additional layer over said channel layer, wherein said at least one additional layer comprises material selected from the group consisting of AlGa_N, Ga_N, and InGa_N, with the proviso that when said at least one additional layer comprises AlGa_N material, said AlGa_N material is Al_xGa_{1-x}N, wherein x is less than 0.2.
2. (Currently amended) The device of claim 1, ~~comprising~~ wherein said at least one additional layer comprises AlGa_N material, forming an AlGa_N/InGa_N heterostructure with the channel layer.
3. (Currently amended) The device of claim ~~1~~ 2, further comprising a Ga_N layer, ~~an InGa_N layer over the Ga_N layer, and an AlGa_N layer over the InGa_N layer underneath said channel layer.~~
4. (Original) The device of claim 1, which does not comprise an aluminum-containing layer.
5. (Currently amended) The device of claim 4, wherein said at least one additional layer comprises Ga_N material, forming ~~comprising~~ a Ga_N/InGa_N HEMT with the channel layer.
6. (Currently amended) The device of claim 4, wherein said at least one additional layer comprises InGa_N material, forming ~~comprising~~ an InGa_N/InGa_N HEMT with the channel layer.

7. (Currently amended) The device of claim 4 ~~2~~, ~~comprising an AlGaIn layer~~ wherein said AlGaIn material is doped.

8. (Currently amended) The device of claim 7 ~~2~~, wherein the AlGaIn ~~layer~~ material is undoped.

9. (Currently amended) The device of claim 7, wherein the AlGaIn ~~layer~~ material comprises a dopant providing an increased sheet density in relation to a corresponding undoped AlGaIn layer.

10-34. (Cancelled).

35. (Currently amended) The device of claim 4 ~~2~~, wherein said ~~InGaIn alloy contains an amount of indium, In/(In+Ga), that does not exceed 0.20~~ AlGaIn material is $\text{Al}_x\text{Ga}_{1-x}\text{N}$, wherein x is about 0.1.

36. (Previously added) The device of claim 1, wherein the channel layer comprising an InGaIn alloy has a thickness in a range of from about 100 to about 5000 nanometers.

37. (Previously added) The device of claim 1, wherein the channel layer comprising an InGaIn alloy has a thickness in a range of from about 200 to about 2000 nanometers.

38. (Previously added) The device of claim 1, wherein the channel layer comprising an InGaIn alloy has a thickness in a range of from about 400 to about 1000 nanometers.

39. (Currently amended) The device of claim 1, comprising:

a substrate;
a GaN buffer layer on said substrate;
said channel layer on said GaN buffer layer;
~~an AlGaN spacer layer~~ said at least one additional layer on said channel layer, said at least one additional layer comprising undoped AlGaN material and forming an AlGaN spacer layer; and
a doped AlGaN donor layer on said AlGaN spacer layer.

40. (Currently amended) The device of claim 1, comprising:

a substrate;
a GaN buffer layer on said substrate;
said channel layer on said GaN buffer layer;
~~a GaN spacer layer~~ said at least one additional layer on said channel layer, said at least one additional layer comprising undoped GaN material and forming a GaN spacer layer;
and
a doped ~~AlGaN~~ GaN donor layer on said ~~AlGaN~~ GaN spacer layer.

41. (Currently amended) The device of claim 1, comprising:

a substrate;
a GaN buffer layer on said substrate;
said channel layer on said GaN buffer layer;
~~an InGaN spacer layer~~ said at least one additional layer on said channel layer, said at least one additional layer comprising undoped InGaN material and forming an InGaN spacer layer; and
a doped InGaN donor layer on said InGaN spacer layer,

wherein said InGaN spacer layer has a lower InN concentration than said channel layer.

42. (Currently amended) The device of claim 7 39, ~~wherein said AlGaIn layer contains an amount~~
~~of aluminum, $\text{Al}/(\text{Al}+\text{Ga})$, that does not exceed 0.20~~ further comprising a two dimensional
electron gas (2DEG) between the InGaIn channel layer and the AlGaIn spacer layer.

APPENDIX A

Clean Copy of All Pending Claims

1. A gallium nitride-based HEMT device, comprising a channel layer comprising an InGaN alloy and at least one additional layer over said channel layer, wherein said at least one additional layer comprises material selected from the group consisting of AlGaN, GaN, and InGaN, with the proviso that when said at least one additional layer comprises AlGaN material, said AlGaN material is $\text{Al}_x\text{Ga}_{1-x}\text{N}$, wherein x is less than 0.2.
2. The device of claim 1, wherein said at least one additional layer comprises AlGaN material, forming an AlGaN/InGaN heterostructure with the channel layer.
3. The device of claim 2, further comprising a GaN layer underneath said channel layer.
4. The device of claim 1, which does not comprise an aluminum-containing layer.
5. The device of claim 4, wherein said at least one additional layer comprises GaN material, forming a GaN/InGaN HEMT with the channel layer.
6. The device of claim 4, wherein said at least one additional layer comprises InGaN material, forming an InGaN/InGaN HEMT with the channel layer.
7. The device of claim 2, wherein said AlGaN material is doped.
8. The device of claim 2, wherein the AlGaN material is undoped.

9. The device of claim 7, wherein the AlGa_N material comprises a dopant providing an increased sheet density in relation to a corresponding undoped AlGa_N layer.
35. The device of claim 2, wherein said AlGa_N material is Al_xGa_{1-x}N, wherein x is about 0.1.
36. The device of claim 1, wherein the channel layer comprising an InGa_N alloy has a thickness in a range of from about 100 to about 5000 nanometers.
37. The device of claim 1, wherein the channel layer comprising an InGa_N alloy has a thickness in a range of from about 200 to about 2000 nanometers.
38. The device of claim 1, wherein the channel layer comprising an InGa_N alloy has a thickness in a range of from about 400 to about 1000 nanometers.
39. The device of claim 1, comprising:
- a substrate;
 - a Ga_N buffer layer on said substrate;
 - said channel layer on said Ga_N buffer layer;
 - said at least one additional layer on said channel layer, said at least one additional layer comprising undoped AlGa_N material and forming an AlGa_N spacer layer; and
 - a doped AlGa_N donor layer on said AlGa_N spacer layer.
40. The device of claim 1, comprising:
- a substrate;
 - a Ga_N buffer layer on said substrate;
 - said channel layer on said Ga_N buffer layer;

said at least one additional layer on said channel layer, said at least one additional layer comprising undoped GaN material and forming a GaN spacer layer; and
a doped GaN donor layer on said GaN spacer layer.

41. The device of claim 1, comprising:

a substrate;

a GaN buffer layer on said substrate;

said channel layer on said GaN buffer layer;

said at least one additional layer on said channel layer, said at least one additional layer comprising undoped InGaN material and forming an InGaN spacer layer; and

a doped InGaN donor layer on said InGaN spacer layer,

wherein said InGaN spacer layer has a lower InN concentration than said channel layer.

42. The device of claim 39, further comprising a two dimensional electron gas (2DEG) between the InGaN channel layer and the AlGaN spacer layer.